From:	John Kern
To:	Draper, Cynthia E; Curtis, Emmet F
Cc:	Saric, James; Bondy, Garret E; Paul Bucholtz; King, Todd W.
Subject:	Post discussion evaluation of Fish trend decay rates
Date:	Friday, October 25, 2013 2:25:51 PM
Attachments:	Additional Comment on Trned Rates After recent discussions with AMEC 2013-10-25.docx

Cynthia and Emmet,

Thanks for the discussion yesterday. After our call I did a little more homework and I think we may want to revise the range of decay rates slightly and also may be able to thin down the number of combinations necessary. The attached is a rough look at this question and where I am ending up after getting a little more up to speed on the trend estimates in the FS etc.

The punchline is a small change in the range of decay rates I think are well supported with a best estimate of about 2% and uncertainty bounds ranging from (UCL95=no decay to 5.3%). Note I'm suggesting using UCLs rather than "scenarios" because the added information related to probability is important in helping people to understand our weight of evidence for each value.

In particular, we are saying that we are very confident that there will be decay in concentrations—95% sure it will be greater than 0%. The no decay scenario is very unlikely and should not be considered equally with the 2% decay rate which is our most likely scenario.

Similarly, the 5.3% decay scenario or faster is also highly unlikely given our understanding of the data, and again should not be considered equally with our best case number of 2% or so.

My basis for these ranges of values are in the attached memo. Also I suggest limiting the number of cases to just three cases based on our best estimate of 2% decay considered for the three candidate step-downs we discussed. The range of outcomes for each of the three cases should be communicated as confidence bounds, so that for a value like time to clean there are 3 rows in the table containing best estimate and two additional columns indicating the LCL and UCL each of which are possible but much less likely as discussed above. I think communicating these bounds as equally likely scenarios is a mistake and also resulting in cumbersome presentation of many combinations in the report.

So, see the attached and I'm open to discussion as usual. I understand that there is more than one way to do this.

John

Note: I have cc'd a modest group I expect will be interested, but am not intending to elevate the question.

After recent discussions with AMEC (Cynthia and Emmet) I have reviewed the temporal trend estimates that have been proposed for evaluating alternative remedial options, and I believe the range of decay rates currently being considered (2% to 7.7%) may be inaccurate for representing human exposures. It is my understanding that EPA will focus on the 100% smallmouth bass diet which according to Table 1-4 would lead to the use of point estimates for temporal decay rates that range from 0% per year (i.e. not declining) to approximately 3.4% per year. It is also understood that these decay rates are estimated with some uncertainty, although standard errors of the estimates are not reported. In my previous analysis I found standard errors on the order of 1% per year, so assuming that AMEC has similar levels of uncertainty, 95% intervals for these decay rates are would be approximately as shown in the following table.

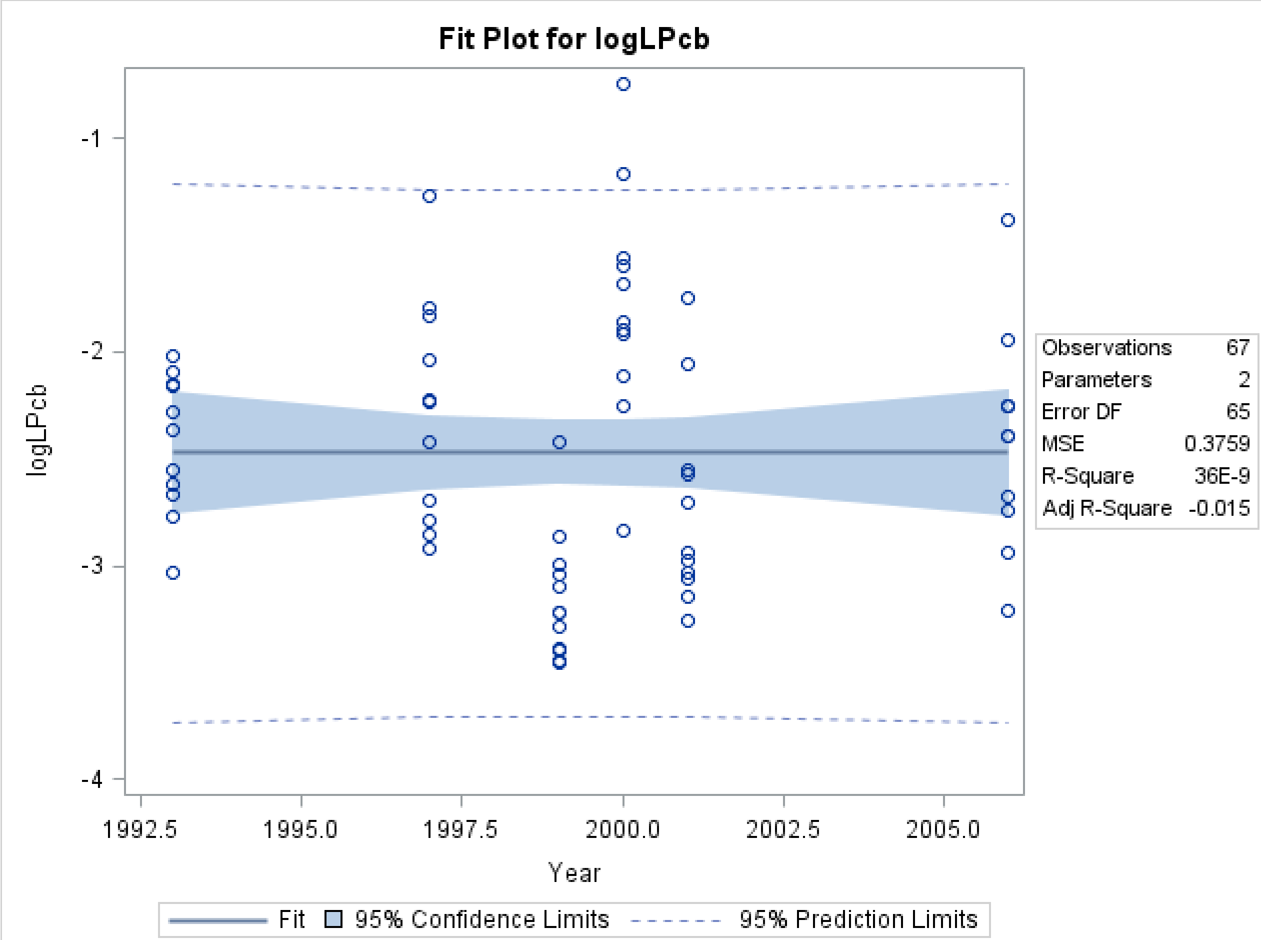
Reasonable Range of Decay Rates				
ABSA	Decay Rate	Assumed Standard Errors	LCL95	UCL95
ABSA3	3.40	1.0	1.44	5.36
ABSA4	-0.30	1.0	ND[1]	1.66
ABSA5	2.30	1.0	0.34	4.26
Urban	-0.40	1.0	ND	1.56
Dams	2.60	1.0	0.64	4.56

My analysis of the “urban” section differed from that reported in the previous table by AMEC. My analysis differes from that reported by AMEC in two ways; 1) I included data from Kalamazoo Avenue, Mosel Ave and Avenue D, which may differ from the subs4et selected by AMEC, and 2) my analysis was based on the ANCOVA approach recommended by Hebert and Keenleyside (1995) rather than analysis of lipid normalized PCB concentrations. Whith this approach, I estimated the decay rate in the “urban” section to be 2% with confidence limits of approximately 0% to 4%. Given the range of subjective choices in data subsetting and analysis methods, I believe a reasonable range for the decay rate for smallmouth bass fillets to be from not declining to an upper bound of 5.4% and a best estimate of approximately 2%.

The draft FS includes rates up to 7.5% which I do not believe are justified for evaluating human exposure, because they are based on whole body smallmouth bass and possibly carp fillets. Table 1-4 is included here for reference. It should also be noted that decay rates estimated from ABSA-01 at Ceresco appear to be in error, given the relative stability of PCB concentrations at or around 0.05 mg/kg since the late 1990s followed by a very low average in a single year in 2011. This also coincides with the change in laboratories which may have lower analytical sensitivity to low concentrations. This issue has

[1] ND indicates that the estimated decay rate is increasing or not decaying. It would be reasonable to assume not decaying as an upper bound for time to selected thresholds as there is little in the conceptual model that would support actual increasing tissue concentrations over any long period of time.

not been fully explored, however trend estimates are highly sensitive to inclusion or exclusion of this single time step. For example a regression from 1993 through 2006 results in no trend (Figure below) in comparison to the decreasing trend of 5% reported in the draft FS. We suggest that trends at Ceresco should exclude data form 2011, although it is not clear why there are problems with these data that we do not see at other ABSAs



Trend in SMB Fillets at Ceresco Reservoir from 1993 through 2006.

Recommendation

To simplify reporting of a range of scenarios, I would recommend generating scenarios for the 2% best-estimate decay rate (before and after remediation) under MNA with associated confidence bounds. To simulate active remediation, I would replicate this single scenario with its associated confidence bounds for the cases representing three alternative step down scenarios. This results in just three cases each with it's associated uncertainty bounds. I think it is unnecessary to consider the additional cases where decay rates are mixed –slow before remediation and fast after etc. These cases are all bounded by the slow-low and fast-fast scenarios depicted by the upper and lower confidence intervals. The likelihood of the fast-slow or slow-fast scenarios are not known and therefore additional scnarios with these many combinations add little to the understanding of the overall uncertainty provided by the slow-slow and fast-fast scenarios.

Reference

Hebert, C. E. and Keenleyside, K. A. (1995), To normalize or not to normalize? Fat is the question. Environmental Toxicology and Chemistry, 14: 801–807. doi: 10.1002/etc.5620140509

Table 1-4
Percent Decline in Fish Tissue Total PCB Concentrations in Sections of Area 1 and the Reference Area of the Kalamazoo River, Michigan.
Area 1, OU-5 Kalamazoo River

Area 1

	SMB Fillet			SMB Whole Body			Carp Fillet		
	Lipid Corrected			Lipid Corrected			Lipid Corrected		
	Mixed order	First order	Straight linear	Mixed order	First order	Straight linear	Mixed order	First order	Straight linear
ABSA-03	2.0%	3.4%	4.5%	2.8%	3.2%	3.1%	DNC	4.2%	6.3%
ABSA-04	DNC	-0.3%	-1.2%	DNC	6.0%	4.8%	DNC	2.1%	2.5%
ABSA-05	DNC	2.3%	1.6%	10.4%	7.7%	9.2%	DNC	2.8%	2.7%
Urban	DNC	-0.4%	-1.3%	DNC	1.9%	1.7%	DNC	1.9%	2.3%
Dams	DNC	2.6%	2.2%	DNC	7.5%	9.0%	DNC	2.8%	3.0%

Reference Areas

	SMB Fillet			SMB Whole Body			Carp Fillet		
	Lipid Corrected			Lipid Corrected			Lipid Corrected		
	Mixed order	First order	Straight linear	Mixed order	First order	Straight linear	Mixed order	First order	Straight linear
ABSA-01	5.3%	5.1%	7.7%	DNC	3.5%	3.7%	DNC	0.03%	-1.3%
ABSA-02	-1.1%	-0.97%	-1.0%	DNC	-1.7%	-1.5%	DNC	3.1%	3.4%

Notes:
Non-significant percent decline
Significant percent decline
Mixed Order model converged
Negative percent decline values indicate increases in Total PCB concentrations

PREPARED/DATE: LSV 5/22/13
CHECKED/DATE: NTG 5/22/13

Reproduction of Table 1-4 from Draft FS.